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ABSTRACT

This secondary-level, competency-based curriculum contains 11 modules for Nursery and Greenhouse Worker. A companion teacher's guide is available separately--see note. Each module contains a number of West Virginia-validated Nursery and Greenhouse Worker tasks/competencies with a performance guide listing the steps needed to perform each task, learning activities, and evaluation. Student checklists and handouts may also be provided. Titles of the modules are (1) Occupational Knowledge, (2) Soil Preparation, (3) Seeds, (4) Rooting and Propagation, (5) Container Plants, (6) Transplanting, (7) Fertilizer, (8) Greenhouse Control, (9) Disease and Pest Control, (10) Sale Preparation, and (11) Special Duties. (YLB)

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ED203093

Student Material

NURSERY AND GREENHOUSE WORKER

Competency Based Education Curriculum

Prepared by:
Diana Long
RCA Education Service

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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PREFACE

It is with great pleasure that we bring you another West Virginia competency based education (CBE) curriculum. This Nursery and Greenhouse Worker curriculum was developed for West Virginia under contract, by RCA Education Service. The effort was coordinated by staff of the Bureau of Vocational, Technical and Adult Education.

The Bureau began advocating competency based education in 1974. Since that time West Virginia has produced over 25 CBE curricula in various occupational areas. We also have a number of CBE curricula currently in the process of being developed and/or fieldtested.

This Nursery and Greenhouse Worker curriculum was inserviced and disseminated to West Virginia vocational agriculture teachers at regional meetings during the spring of 1980. Additional copies of this curriculum are available from the:

Vocational Curriculum Laboratory
Cedar Lakes Conference Center
Ripley, West Virginia 25271
Telephone: 1-800-642-2670

I trust this material will be of assistance in your program. Any suggestions you may have for improving this curriculum may be sent to our State Curriculum Lab. Through this feedback we plan to continually update and revise our materials.

VOCATIONAL, TECHNICAL AND ADULT EDUCATION

Clarence E. Burdette

Clarence E. Burdette
Assistant State Superintendent of Schools

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Businesses

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Shady Side Landscaping, St. Albans, WV

Price Bros. and Sons, Inc., Beckley, WV

Stadler Greenhouses, Nitro, WV

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Individuals

Ronald King, Barboursville High School

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Harold Skidmore II, Calhoun County High School

Purpose of the

NURSERY AND GREENHOUSE WORKER

Competency Based Education Curriculum

This competency based education (CBE) curriculum, with Teacher's Guide, has been developed so that you may adapt any or all of its contents to accommodate your teaching style.

The purpose of this CBE curriculum is to provide you and your advisory committee with a set of West Virginia-validated Nursery and Greenhouse Worker Tasks, along with (1) the Steps needed to perform each task, (2) the Evaluation Standards, and (3) suggested Learning Activities.

Depending on your teaching style, you may want to use this material primarily to assist you in your own teaching plans, or the material has been developed in enough detail so that it may, with proper supervision, be used by your students.

How you use this CBE curriculum is up to you. It has been based on the best Horticultural information and material available in 1978-79 in West Virginia and the United States.

Student Competency Sheets

STUDENT COMPETENCY SHEET

MODULE 01 — Occupational Knowledge

COMPETENCY C1 — Describe duties common to nursery/greenhouse workers.

PERFORMANCE GUIDE

1. Describe duties that may be required of nursery/greenhouse workers.
2. Describe duties common to nursery/greenhouse workers in your area.

LEARNING ACTIVITIES

1. Read the entry under 405.687-014, Horticulture Worker (Agric.) II, found on page 271 in the 1977 edition of the Dictionary of Occupational Titles. Using the information found, make a list of the duties that may be required of nursery/greenhouse workers. Check your list with your instructor, if it is satisfactory, go on to Learning Activity 2.

2. Take the list you made in Learning Activity 1 to a nursery or greenhouse in your area. From your observations and conversations with the workers, make a check beside each duty on the list that is performed by workers in that business. Add any duties that they describe that are not on your list. When you return to the classroom, compile your list with the lists of other students. When you have finished, ask for the Evaluation.

EVALUATION

Present a report, either orally or in writing which describes the following:

1. Duties common to nursery/greenhouse workers in your area.
2. Additional duties which may be required of nursery/greenhouse workers.

If your report is written, it must be neat and free of spelling errors.

STUDENT COMPETENCY SHEET

MODULE 01 Occupational Knowledge

COMPETENCY 02 Describe working conditions common to nursery/greenhouse workers.

PERFORMANCE GUIDE

1. Describe common salary, benefits, and working hours of nursery/greenhouse workers.
2. Describe the difference in working conditions between nursery workers and greenhouse workers.
3. Describe any extreme working conditions of either nursery or greenhouse workers.

LEARNING ACTIVITIES

1. Contact your local West Virginia Department of Employment Security office and ask for the following information:
   a. current salary ranges for entry-level nursery/greenhouse workers.
   b. basic benefits currently being offered to entry-level nursery/greenhouse workers.
   c. typical working hours.
   d. possibilities of seasonal lay-offs.

   Report your findings to your instructor. If your work is satisfactory, go on to Learning Activity 2.

2. Read "Jobs In Horticulture", including the sections under "Job Title: Nursery Employee" starting on page 3 in Introductory Horticulture. Write a report which describes the difference in working conditions for a nursery employee and a greenhouse employee. Check your work with your instructor. If it is satisfactory, go on to Learning Activity 3.

3. Using the information that you found in Learning Activity 2 and in your observation of nursery/greenhouse workers, make a list of working conditions that you would describe as extreme (heavy physical labor, exposure to the elements, long working hours, etc.). Compare your list with the list of another student. When you are finished, ask for the Evaluation.

EVALUATION

In a role-playing situation, you must convince your instructor that he/she should be a nursery/greenhouse worker. You must receive a satisfactory rating on each item of the Student Checklist.

STUDENT CHECKLIST

	Satisfactory	Unsatisfactory
1. Describes salary ranges		
2. Describes benefits		
3. Describes working hours		
4. Describes the working conditions of nursery workers		
5. Describes the working conditions greenhouse workers		
6. Describes extreme working conditions.		

STUDENT COMPETENCY SHEET

MODULE 01 — Occupational Knowledge

COMPETENCY 03 — Describe educational and technical requirements for nursery/greenhouse workers.

PERFORMANCE GUIDE

1. Describe general education requirements.
2. Describe technical knowledge and skill requirements.
3. Describe education and technical training opportunities available.

LEARNING ACTIVITIES

1. Contact at least two employers who hire nursery/greenhouse workers and make a list of the general education and basic technical skills that they require for entry-level, midlevel, and high-level employees. Compare this list to the training you will have received after you finish this course. Check your work with your instructor. If it is satisfactory, go on to Learning Activity 2.

2. Ask your school counselor for sources of information that you can use to compile a list of additional education and technical training opportunities. Write a report describing these opportunities, making sure to indicate whether these courses are offered by a public school system, a private trade school, a college or university, or through an accredited correspondence course.

3. Talk with your Job Placement Counselor and investigate on-job-training opportunities available for you with the school and other employment. Report orally to your instructor. If your work is satisfactory, ask for the Evaluation.

EVALUATION

Using the information gathered in the Learning Activities, write a report describing the following:

a. your long-range employment goals
b. the education and technical skill level that will be necessary in order for you to reach those goals
c. a plan for acquiring the necessary education and technical skills.

The plan must be feasible and must be written neatly and correctly.

STUDENT COMPETENCY SHEET

MODULE 01 — Occupational Knowledge

COMPETENCY 04 — Describe the economic outlook for nursery/greenhouse workers for the next 10 years.

PERFORMANCE GUIDE

1. Describe the current job market opportunities for nursery/greenhouse workers.
2. Describe projected future job market opportunities for nursery/greenhouse workers.
3. Describe projected salaries and benefits.

LEARNING ACTIVITIES

1. Talk to your school's Job Placement Counselor and ask about the current job market for nursery/greenhouse workers. Report your findings to your instructor orally. If your work is satisfactory, go on to Learning Activity 2.

2. Visit your school library or your nearest public library. Ask for the most recent editions of at least three newspapers. Make a list of all the job openings for nursery/greenhouse workers that are advertised in the classified advertisement section under "Help Wanted". Compile your list with the lists of other students. Check with your instructor. If your work is satisfactory, go on to Learning Activity 3.

3. Read "The Future of the Horticulture Industry" found on page 8 in Introductory Horticulture. List at least three reasons why the horticulture industry is in a state of rapid growth. Check your work with your instructor. If it is satisfactory, go on to Learning Activity 4.

4. Ask your county's Agricultural Extension Agent for sources of information projecting the outlook for salaries and benefits for nursery greenhouse workers for the next 10 years. Report your findings to your instructor. If your work is satisfactory, ask for the Evaluation.

EVALUATION

Prepare a report, to be presented either orally or in writing, that describes the following:

a. current job market opportunities for nursery/greenhouse workers.
b. projected future job market opportunities for nursery/green-

house workers.

c. projected salaries and benefits.

If your report is written, it must be neat and free of spelling errors. You may use references.

STUDENT COMPETENCY SHEET

MODULE 02 Soil Preparation

COMPETENCY 01 Fumigate soil to be used in soil mixtures.

PERFORMANCE GUIDE

1. Identify problem.
2. Select fumigant.
3. Prepare soil to have a loose texture.
4. Seal plastic covering over area to be treated.
5. Apply fumigant according to manufacturer's recommendations.

LEARNING ACTIVITIES

1. Attend a lecture by your instructor on fumigants. Take notes to make sure you know:
   a. definition of fumigant.
   b. safety precautions to use when handling fumigants.
   c. how to prepare the soil for fumigants.

   Be prepared to pass a quiz on the information.

2. Read pages 104-105 "Soil Fumigation" in Ornamental Horticulture as a Vocation. Report on the best system (cost, equipment, time required etc.) for your greenhouse or nursery. Share your report with the class.

3. Visit an agribusiness in your area. Identify the fumigants available and the purpose of each. Compile your list with another student's.

4. Attend a lecture/demonstration by your instructor on preparing the soil for fumigants and sealing the area. After the lecture, prepare and seal an area for fumigation. Have your instructor check your work. If it is satisfactory, go on to Learning Activity 4.

5. Attend a lecture by your instructor on Safety Precautions When Using Fumigants. You must follow these precautions at all times.

6. Your instructor will give you a list of soil problems. Identify the type of fumigant to use and outline the procedures you will follow to correct the problem. If your work is satisfactory, ask for the Evaluation.

EVALUATION

You will be given an area of soil and a description of the problem. Select the proper fumigant and fumigate the soil. You must receive a satisfactory rating on each item of the Student Checklist.

STUDENT CHECKLIST

	Satisfactory	Unsatisfactory
1. Fumigant selected		
2. Soil prepared		
3. Area sealed in plastic		
4. Fumigant applied according to manufacturer's recommendations		

STUDENT COMPETENCY SHEET

MODULE 02 — Soil Preparation

COMPETENCY 02 — Prepare soil mixtures for growing plants.

PERFORMANCE GUIDE

1. Identify plant.
2. Identify type of growing medium required.
3. Sterilize and fumigate soil.
4. Add sand, peat, etc. as required.

LEARNING ACTIVITIES

1. View the filmstrip "Growing Media for Ornamental Plants". Answer the study questions given to you by your instructor. Discuss your answers with the class. When they are satisfactory, go on to Learning Activity 2.

2. Read pages 31-34 in Introductory Horticulture. Be prepared to pass a quiz on the characteristics of soils.

3. Read pages 34-35 in Introductory Horticulture and answer the following questions:
   a. What are the advantages of using soilless media?
   b. What are the disadvantages?
   c. What are the materials that make up the soilless media?
   d. What are some common combinations?

   Check your answers with your instructor. If they are satisfactory go on to Learning Activity 4.

4. Visit a nursery in your area and write down 10 plants and describe the growing media for the plants. Compare your list with another student's. Add their list to yours. Continue doing so until you have a list of all the plants grown in the nursery and their soil media. Be prepared to pass a quiz on the information.

EVALUATION

For the following common houseplants, prepare the soil mixture. The media must match recommended ratios. You may not use references.

a. Asparagus Fern (Asparagus sprengeri)
b. Azalea (Rhododendron)
c. Swedish Ivy (Plectranthus)
d. African Violet (Saintpaulia)

ANSWERS - EVALUATION 02/02

a. Asparagus Fern - 1 peat 1 sand 1 soil
b. Azalea - 1 peat 1 sand 1 soil
c. Swedish Ivy - 3 peat 2 sand 1 soil
c. African Violet - 3 peat 2 sand 1 soil

STUDENT COMPETENCY SHEET

MODULE 03 Seeds

COMPETENCY 01 Clean podded seeds and fleshy seeds.

PERFORMANCE GUIDE

1. Identify seed.
2. Soak fleshy seed.
3. Loosen fleshy seed and separate seed from pulp.
4. Remove protective coating and pulp from the padded seed by squeezing the berry to remove the seed.
5. Allow seed pods to dry and break the pods to release the seeds.
6. Remove stems and other debris by screening through a wire mesh.
7. Store cleaned seed in a dry cool place until ready to plant.

LEARNING ACTIVITIES

1. Read pages 84-85 in Introductory Horticulture and answer the following questions:
   a. Define seed coat.
   b. Define endosperm.
   c. Define germination.
   d. Define embryo.
   e. Why is it important to identify locally grown seeds?
   f. Define hybrid.

   Check your answers with your instructor. Be prepared to pass a quiz on the information.

2. Attend a lecture/demonstration by your instructor on podded and fleshy seeds. Collect 10 examples of each type of seeds.

3. Follow the steps in the Performance Guide and practice cleaning podded and fleshy seeds. Check with your instructor after each major step. When you are ready, ask for the Evaluation.

EVALUATION

Your instructor will give you a small packet of podded and fleshy seeds. Separate the seeds and clean the seeds. You may not use references. You must receive a satisfactory rating on each item of the Student Checklist on the following page.

STUDENT CHECKLIST

	Satisfactory	Unsatisfactory
1. Seeds identified		
2. Fleshy seeds soaked and pulp removed		
3. Pulp removed from podded seeds		
4. Seed pods dried		
5. Stems and other debris removed		
6. Seeds stored		

STUDENT COMPETENCY SHEET

MODULE 03 — Seeds

COMPETENCY 02 — Plant seeds in flats, packs, pots or trays.

PERFORMANCE GUIDE

1. Select seed to be planted.
2. Prepare soil mixture.
3. Place soil in flats, packs, pots or trays.
4. Prepare soil by smoothing and firming it in the container.
5. Prepare seed for planting.
6. Sow seeds in rows at the recommended depth and spacing.
7. Place cheese cloth or other similar materials over the top of the seed container.
8. Water lightly until medium is moist.
9. Set recommended germination temperature in germination area.

LEARNING ACTIVITIES

1. Read pages 85-86 in Introductory Horticulture. Select a seed and identify the best type of soil mixture to use. Defend your choice to your instructor.

2. Attend a lecture/demonstration by your instructor on using a skew and row marker. After the lecture practice preparing a flat for planting. Check with your instructor after each major step. When your work is satisfactory, go on to Learning Activity 3.

3. Read pages 87-89 in Introductory Horticulture. Answer the following:
   a. How do you know how far apart to plant the seeds?
   b. Define capillary action.
   c. Why should small plants be watered by capillary action?
   d. Describe ways to provide "bottom heat".
   e. Define hardening off.
   Discuss your answers with your class. Be prepared to pass a quiz on the information.

4. Read page 91 "Special Treatment of Seeds for Germination" in Introductory Horticulture. Give two examples of the following:
   a. seeds which need to be soaked or scratched.
   b. seeds which need cold rest period.

c. seeds which need alternate wetting and drying.
d. seeds which need darkness.
Check your answers with your instructor.

5. Follow the Performance Guide on the previous page and plant seeds in a flat. Check with your instructor after each major step. Keep a record of the date the seeds were planted, and when they germinated.

6. Your instructor will give you a list of ten seeds. Describe for each type of seed:
   a. the soil mixture.
   b. depth and spacing of seeds.
   c. germination temperature.
   d. time allowed for germination.

EVALUATION

You will be given seed to be planted, necessary equipment and supplies. Plant the seed. The seed must be planted at recommended depths and time according to planting chart as verified by your instructor.

STUDENT COMPETENCY SHEET

MODULE 03 Seeds

COMPETENCY 03 Transplant Seedlings

PERFORMANCE GUIDE

1. Select pots or flat to be used.
2. Prepare soil to be used in pots.
3. Place soil in pots.
4. Transplant seedlings to the pots.
5. Firm the soil after setting the seedling.
6. Water thoroughly.
7. Place pots of seedlings in area to grow.
8. Water periodically.

LEARNING ACTIVITIES

1. Read pages 89-91 "Transplanting Seedlings" in Ornamental Horticulture. In your own words write the steps you should follow when transplanting seedlings. Discuss your work with your instructor.

2. Visit an agribusiness in your area. Make a list of the pots on the market for transplanting seedlings. Write down the advantages/disadvantages of each. Select the one you feel is best. Defend your choice to the class.

3. Attend a lecture/demonstration by your instructor on removing seedlings from the germinating media. After the lecture have the instructor observe your work. When it is satisfactory, ask for the Evaluation.

EVALUATION

You will be given seedlings ready to be planted in pots, necessary equipment and supplies. Transplant the seedlings to pots. The plant must not be wilted when observed 24 hours later.

STUDENT COMPETENCY SHEET

MODULE 03 Seeds

COMPETENCY 04 Harvest seeds from mature plants

PERFORMANCE GUIDE

1. Select plants with a crop of mature seeds ready to be harvested.
2. Remove seed from the branches of the plants by cutting or picking seed pods, bunches of berries or individual berries.
3. Place seed pods, bunches of berries or individual berries in specified containers.
4. Label and date container with name and location of plant producing the pods or berries.

LEARNING ACTIVITIES

1. Attend a lecture by your instructor on how to tell when a seed is mature for harvesting. Take any notes to help you. Be prepared to pass a quiz on identifying mature seeds. You must be 80% accurate.

2. Attend a lecture/demonstration by your instructor on cutting and picking mature seeds. In your own words, write down the steps to follow to make sure you do not damage the seeds. Check your work with your instructor.

3. Design a label for harvested seeds. Be sure to include the name of the plant, the date of harvest and the variety.

4. Follow your lecture notes and the performance guide above and harvest mature seeds. Check with your instructor after each major step. When you are ready, ask for the Evaluation.

EVALUATION

You will be given plants with mature seed ready to be harvested and the tools and supplies you will need to harvest the seed. The seeds must not be damaged and they must be labeled correctly.

STUDENT COMPETENCY SHEET

MODULE 04 Rooting and Propagation

COMPETENCY 01 Take cuttings from softwood and evergreen hardwood.

PERFORMANCE GUIDE

1. Select stock plants to be used for cuttings.
2. Determine type of wood to be used for cuttings.
3. Take cuttings at 3 and 6 inches long from current terminal wood.
4. Base of the cutting must be cut at a slight angle. (approximately 45° angle)
5. Keep cuttings moist as they are taken.

LEARNING ACTIVITIES

1. Study the drawings in Student Handout 04/01/01. Define and describe how each of the following plant parts are important in propagation. Use pages 19-20 and 97-101 in Introductory Horticulture as a reference.

   a. terminal bud
   b. axillary bud
   c. node
   d. petiole
   e. stipule
   f. leaf blade

   Discuss your answers during a class discussion.

2. Attend a lecture/demonstration by your instructor on selecting the proper plants to use for cuttings. After the lecture, your instructor will ask you to select six plants which would be suitable for cutting. Each of the plants must be healthy but not too succulent. When you can identify proper plants for cutting, go on to Learning Activity 3.

3. Read pages 97-106 in Introductory Horticulture and in your own words describe the steps to take when you are taking cuttings from softwood and evergreen hardwoods. Check your work with your instructor.

4. Attend a lecture/demonstration by your instructor on taking cutting from softwood and evergreen hardwood. Take any notes to help you. Be prepared to pass a quiz on the information.

5. Follow your notes from the lecture and the Performance Guide on the previous page, and practice taking cuttings from softwood and evergreen hardwood. Check with your instructor after each major step. When your work is satisfactory, ask for the Evaluation.

EVALUATION

You will be given stock plants to use for taking cuttings and the equipment and supplies you will need. Take cuttings. The cut must be at a 45° angle and they must be taken from current terminal wood. You may not use references.

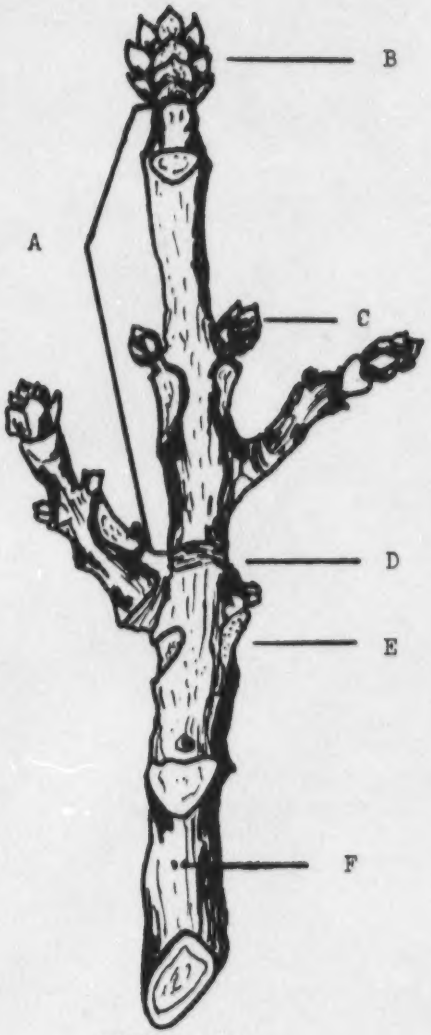


FIGURE 1

Figure 1

Parts of a Stem

A. One year of growth from one bud scar to another
B. Terminal Bud
C. Axillary Bud
D. Bud Scale Scar
E. Leaf Scar
F. Lenticel (Breathing Pore)

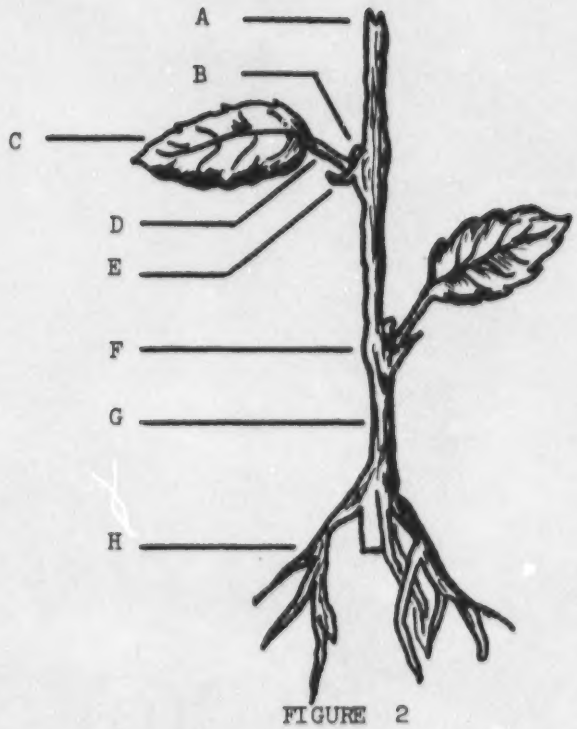


FIGURE 2

Figure 2

Stem Cutting

A. Growing Point (Terminal Bud)
B. Axillary Bud
C. Leaf Blade
D. Petiole
E. Stipule
F. Node
G. Stem
H. New Roots (from node)

STUDENT COMPETENCY SHEET

MODULE 04 — Rooting and Propagation

COMPETENCY 02 — Stick hardwood cuttings for rooting, including applying root hormone.

PERFORMANCE GUIDE

1. Prepare the rooting media.
2. Prepare the cutting.
3. Stick cuttings.
4. Water thoroughly after sticking.
5. Water periodically as needed.

LEARNING ACTIVITIES

1. Read pages 49-50 "Rooting Hormones" in Introductory Horticulture, and answer the following questions.
   a. Which plants could root in a humid moist area without chemicals?
   b. What is the natural rooting chemical found in plant stems?
   c. Define IBA and NAA. Which is used most?
   d. Why do rooting hormones contain fungicide?

   Check your answers during a class discussion.

2. Read pages 112-117 in Introductory Horticulture. Answer the self-evaluation on pages 117-118. When you are finished, check your answers with your instructor. If they are satisfactory, go on to Learning Activity 3.

3. Report orally or in writing on the differences between taking soft and hardwood cuttings. Make sure your report covers the differences in: selecting the cutting wood; collecting the cutting wood; taking cuttings; storage of cuttings.

4. Attend a lecture/demonstration by your instructor on planting or lining out cuttings. Take notes to make sure you know:
   a. when to plant the cuttings .
   b. how far apart you place the cuttings.
   c. how deep to plant the cuttings.
   d. how to prepare the soil.
   e. what percentage of the roots will grow?
   f. how you care for hardwood deciduous cuttings.
   g. how often to water.

   Be prepared to pass a quiz on the information.

5. Practice sticking hardwood cuttings, using the lecture notes and Performance Guide. Check with your instructor after each major step. When you are ready, ask for the Evaluation.

EVALUATION

You will be given hardwood cuttings ready to be rooted and the supplies and equipment you will need. Root the cuttings. The cuttings must be planted deep enough so that only one bud shows above the soil and they should be planted 6 to 8 inches apart.

STUDENT COMPETENCY SHEET

MODULE 04 — Rooting and Propagation

COMPETENCY 03 — Stick softwood cuttings for rooting, including applying root hormones.

PERFORMANCE GUIDE

1. Prepare the rooting media.
2. Prepare the cutting.
3. Stick cuttings.
4. Water thoroughly after sticking.
5. Water periodically as needed.

LEARNING ACTIVITIES

1. Read pages 49-50 "Rooting Hormones" in Introductory Horticulture, and answer the following questions.
   a. Which plants could root in a humid moist area without chemicals?
   b. What is the natural rooting chemical found in plant stems?
   c. Define IBA and NAA. Which is used most?
   d. Why do rooting hormones contain fungicide?

   Check your answers during a class discussion.

2. Read pages 101-109 in Introductory Horticulture. Answer the Self Evaluation on pages 110-111. When you are finished, check your answers with the instructor. If they are satisfactory, go on to Learning Activity 3.

3. Report orally or in writing on the differences between taking soft and hardwood cuttings. Make sure your report covers the differences in selecting the wood; collecting the wood; taking the cuttings and storage of the cuttings.

4. Attend a lecture/demonstration by your instructor on planting or lining out cuttings. Take notes to make sure you know:
   a. how deep to plant the cutting.
   b. how to label the cutting.
   c. definition of transpiration.
   d. how to maintain the relative humidity.
   e. how to tell if the roots are growing.
   f. define hardening off.
   g. explain how leaf cuttings are made.
   h. explain how root cuttings are made.

5. Practice sticking softwood cuttings, using lecture notes and the Performance Guide. Check with your instructor after each major step. When you are ready, ask for the Evaluation.

EVALUATION

You will be given softwood cuttings ready to be rooted and the equipment and supplies you will need. Root the cuttings. The lower ½ inch of the leaves must be removed, and the base of the cutting must be dipped in hormone and stuck 1/3 of its length in the rooting media. The cuttings must be spaced so that the leaves barely overlap.

STUDENT COMPETENCY SHEET

MODULE 04 — Rooting and Propagation

COMPETENCY 04 — Propagate ornamental plants by layering.

PERFORMANCE GUIDE

TIP LAYERING

1. Select suitable plant.
2. Prepare the tips.
3. Make the layering.
4. Bend branch into the hole.
5. Cover and keep moist.
6. Transplant when rooted.

AIR LAYERING

1. Select proper plant.
2. Girdle or cleft cut.
3. Pack with sphagnum moss.
4. Remove new plant when roots are ready to transplant..

LEARNING ACTIVITIES

1. Read pages 149-152 "Simple Layering" in Introductory Horticulture. Follow the steps outlined in the text and practice simple layering. Check with your instructor after each major step. When your work is satisfactory, go on to Learning Activity 2.

2. Read pages 152-154 "Air Layering" in Introductory Horticulture and answer the following:
   a. What plants are commercially propagated this way?
   b. When is the best time for air layering?
   c. Define girdle cuts.
   d. How does a girdle cut aid in this process?
   e. Why do you wrap plastic around the moss?
   f. When do you remove the layer for transplanting?

   Check your answers during a class discussion.

3. Prepare a report on the advantages and disadvantages of each type of layering. Use two different references. Your report must be written. Have your instructor review your work. If it is satisfactory, go on to Learning Activity 4.

4. Attend a lecture/demonstration by your instructor on cleft cuts. Take notes to make sure you know:
   a. how to make a cleft cut.
   b. what type of rooting hormone to use.
   c. the purpose of the stone or piece of wood.
   d. when to remove the new plants.

   Be prepared to pass a quiz on the information.

5. Practice making air and tip layering using the girdle cut and cleft cut. Use your lecture notes, text, and the Performance Guide as a reference. Check with your instructor after each major step. When you are ready, ask for the Evaluation.

EVALUATION

Given the equipment and supplies you will need, layer plants using the following methods: air, (girdle and cleft cut) and tip layering. The plant must develop strong roots after the required time. You may not use references.

STUDENT COMPETENCY SHEET

MODULE 04 — Rooting and Propagation

COMPETENCY 05 — Propagate plants through grafting.

PERFORMANCE GUIDE

1. Select the wood.
2. Graft when stock and scion are dormant.
3. Cut the surfaces.
4. Match the tissue.
5. Waterproof the graft.

LEARNING ACTIVITIES

1. Read pages 130-137 in Introductory Horticulture. Answer the self evaluation on pages 137-139. Check your answers during a class discussion.

2. Report orally or in writing the advantages and disadvantages of grafting. Use at least two references. Present your work to your instructor. When your work is satisfactory, go on to Learning Activity 3.

3. Attend a lecture/demonstration by your instructor on the whip or tongue graft. Take notes to make sure you know:
   a. when to whip graft.
   b. three types of plants which are whipped grafts.
   c. where the grafting cut is made on the scion and the root piece.
   d. how to make the tongue cut.

   Be prepared to pass a quiz on the information.

4. Practice cutting wood for whip or tongue graft. When you can cut the two pieces so they fit together evenly, demonstrate your work to your instructor.

5. Write the steps you will follow to graft a scion and root given to you by your instructor. Include where the cuts will be made, and care after the pieces are tied together. Check your work with your instructor. If it is satisfactory, go on to Learning Activity 6.

6. Follow the steps you outlined in Learning Activity 5, and whip graft the scion and root. Check with your instructor after each major step. Repeat the steps for each pair of scions and roots given to you by your instructor. When your work is satisfactory, go on to Learning Activity 7.

7. Read pages 133-137 in Introductory Horticulture. Answer the self evaluation on pages 137-139. Check your answers during a class discussion.

8. Attend a lecture/demonstration by your instructor on side veneer grafts. Take notes to make sure you know:
   a. when to make the graft.
   b. which plants to use the side veneer method of grafting.
   c. how to make the cuts.
   d. how to seal the graft.

   Be prepared to pass a quiz on the information.

9. Write the steps you will follow to side veneer graft a scion and root given to you by your instructor. Include where the cuts will be made, and care after the pieces are tied together. Check your work with your instructor. If it is satisfactory, go on to Learning Activity 10.

10. Follow the steps you outlined in Learning Activity 9 and side veneer the scion and root. Check your work with your instructor after each major step. Repeat the steps for each pair of scions and roots given to you by your instructor. When your work is satisfactory, go on to Learning Activity 11.

11. Attend a lecture/demonstration by your instructor on cleft grafts. Take notes to make sure you know:
   a. how to use cleft grafting tool and wedge.
   b. which stock is best grafted by the cleft method.
   c. when to perform the graft.
   d. where the cuts are made.
   e. how to join the pieces
   f. care after cleft graft is made.

   Be prepared to pass a quiz on the information.

12. Write the steps you will follow to cleft graft a scion and root given to you by your instructor. Include where the cuts will be made and care after the cuts are made. Check your work with your instructor. If it is satisfactory, go on to Learning Activity 3.

13. Follow the steps you outlined in Learning Activity 12, and cleft graft the scion. Check your work with your instructor after each major step. Repeat the steps for each pair of scions and roots given to you by your instructor. When your work is satisfactory, go on to Learning Activity 14.

14. Complete the quiz on Student Handout 04/05/14. When your answers are 100% accurate, ask for the Evaluation.

EVALUATION

You will be given a scion and root and the equipment and supplies

you will need. Choose the best method and graft the pair. You may not use references and you must score a satisfactory rating on each item of the Student Checklist below.

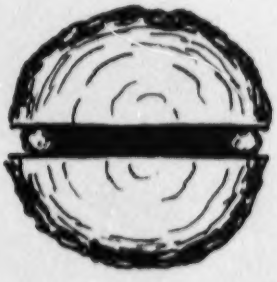
STUDENT CHECKLIST

	Satisfactory	Unsatisfactory
1. Grafting knife used safely		
2. Proper grafting method used		
3. Tissue matched		
4. Root cut is the same length and slope as the scion cut		
5. Cambium matches the growing area at the edge of the root piece on at least one side		
6. Pieces tied together		
7. Graft stored properly		

For the following sketches identify the grafting method used and explain the step or what has just happened.

A

B



C

D

E

F

G

H

I

INSTRUCTOR'S ANSWER SHEET

STUDENT HANDOUT

04/05/14

A. Whip graft: the root before any cuts are made.

B. Side Veneer Graft: root stock cut and ready for graft.

C. Cleft graft: scions set in root stock.

D. Side veneer graft: the scion joined to the rootstock.

E. Side Veneer graft: scion cut and ready for joining.

F. Whip graft: the scion ready for joining.

G. Whip graft: the scion before any cuts are made.

H. Cleft graft: scion ready for cut.

I. Whip grafting: joint covered with grafting wax.

STUDENT COMPETENCY SHEET

MODULE 04 — Rooting and Propagation

COMPETENCY 06 — Propagate plants through budding.

PERFORMANCE GUIDE

1. Select budwood.
2. Determine the correct date to bud.
3. Cut the budwood, label it and protect it so that it does not dry out.
4. Perform the budding process.
5. Check to see if buds have taken.
6. Cut off the rootstock above the bud (the following spring).

LEARNING ACTIVITIES

1. Read pages 140-145 in Introductory Horticulture and answer the Self Evaluation on pages 146-148. Check your answers with your instructor. If they are correct, go on to Learning Activity 2.

2. Write in your own words, how to select budwood and rootstock. Show your work to your instructor. You will be given a supply of rootstock and budwood. Select three good examples of each. Defend your choice to your instructor.

3. Attend a lecture/demonstration by your instructor on T-Budding. Take notes to make sure you know:
   a. how much time the act should take.
   b. which cut do you make first.
   c. how to separate bark from roots.
   d. which buds to use.
   e. how to cut the bud shield.
   f. how to insert bud shield.
   g. how to tie the bud.

   Be prepared to pass a quiz on the information.

4. Complete Student Handout 04/06/04. When you are finished, check your answers with your instructor. If they are correct, go on to Learning Activity 5.

5. Work with another student and practice T-Budding. Check with your instructor after each major step. Take turns performing each step. When you are ready, ask for the Evaluation.

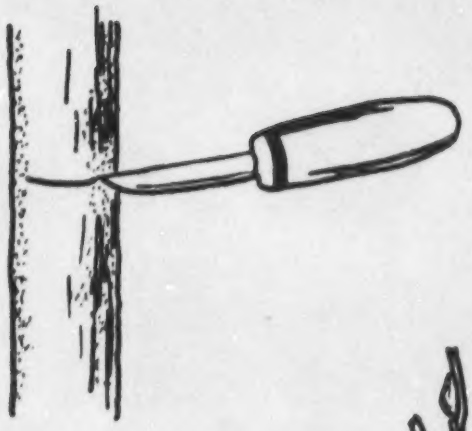
EVALUATION

You will be given the equipment and supplies you will need. Select the best rootstock and budwood and propagate 5 plants by T-Budding. You must receive a satisfactory rating on each item of the Student Checklist below. You may not use references.

STUDENT CHECKLIST

	Satisfactory	Unsatisfactory
1. Budwood selected		
2. Rootstock selected		
3. Rootstock cut and bark separated.		
4. Bud shield cut to fit inside root-stock		
5. Bud shield inserted into rootstock		
6. Bud tied into place firmly		
7. Bud appears plump and normal after three weeks.		

On each of the drawings below describe what is wrong.



1

2

3

4

5

INSTRUCTOR'S ANSWER SHEET

STUDENT HANDOUT

04/06/04

1. Vertical cut is to be made first.
2. Horizontal cut is to be made on top of the vertical cut.
3. Buds should be taken from the middle of the stock.
4. Bud shield too large for T.
5. Cut area is to be covered with the bud exposed.

STUDENT COMPETENCY SHEET

MODULE 05 — Container Plants

COMPETENCY 01 — Identify containers used in nurseries and greenhouses.

PERFORMANCE GUIDE

1. Identify flats
2. Identify unglazed clay
3. Identify wire frames
4. Identify wooden tubs and baskets
5. Identify ceramic containers

LEARNING ACTIVITY

1. Read page 86 "Flats" in Introductory Horticulture. Answer the following questions:
   a. What is the size of most flats?
   b. List the different materials used in making flats.
   c. How do flats drain?
   d. Describe a skew.

   Check your answers with your instructor.

2. Build two flats 14½" x 23" x 2 3/4". Your instructor will give you the materials you will need. When you are finished, check your work with your instructor.

3. Visit a nursery or greenhouse in your area. Make a list of the various types of containers used to grow plants. Report on the advantages and disadvantages of each type of container. Be sure to include:
   a. unglazed clay pots
   b. wooden boxes, tubs, or window boxes
   c. plastics
   d. wire frames or baskets for hanging

   Check your work with your instructor. If it is satisfactory, go on to Learning Activity 4.

4. You will be assigned a plant. Describe how you would care for the plant if it were planted in the following:
   a. clay
   b. wooden tubs
   c. plastic pots - drain holes
   d. glazed clay - no drainage.
   e. wire frame

   Discuss your answers with your class.

EVALUATION

Describe orally or in writing how the following containers effect the care of the plant. You may not use references.

a. unglazed clay
b. wood
c. plastic
d. glazed clay - no drainage
e. wire frame
f. wooden flat

STUDENT COMPETENCY SHEET

MODULE 05 Container Plants

COMPETENCY 02 Plant trees and shrubs in containers.

PERFORMANCE GUIDE

1. Select seedlings
2. Select containers
3. Prepare soil in containers
4. Transplant seedlings to pots
5. Firm the soil after setting the seedling
6. Water thoroughly
7. Place pots of seedlings in area to grow
8. Water periodically

LEARNING ACTIVITIES

1. Read "Planting Deciduous Trees" pages 338-342 in Introductory Horticulture. Complete the Self Evaluation on pages 343-345. Check your answers with your instructor.

2. Read pages 3-7 in Ornamental Horticulture: Harvesting and Planting Trees and Shrubs. Your instructor will assign you specific trees for you to plan their transplant. In your report include the following information:
   a. minimum ball size
   b. time to move the plant
   c. steps to dig the plant
   d. how to transport
   e. how to store plant
   f. when and how to plant the tree/shrub

3. Read pages 8-9 in Ornamental Horticulture: Harvesting and Planting Trees and Shrubs. Your instructor will assign you trees and shrubs for you to plan their transplant using the bare root method. Include the following in your report:
   a. how to puddle the roots
   b. how to transport the plant
   c. heeling-in procedures
   d. when and how to plant the tree/shrub

4. Practice digging a tree or shrub. Check with your instructor after each major step listed above in the Performance Guide. When you are ready, ask for the Evaluation.

EVALUATION

You will be given a tree or shrub to transplant. You must receive a satisfactory rating on each item of the Student Checklist on the following page.

STUDENT CHECKLIST

	Satisfactory	Unsatisfactory
1. Plant dug correctly		
2. Correct harvesting method chosen		
3. Roots protected		
4. Tree/shrub transplanted correctly		

STUDENT COMPETENCY SHEET

MODULE 05 Container Plants

COMPETENCY 03 Protect container plants from the weather.

PERFORMANCE GUIDE

1. Determine type of plant to be protected.
2. Measure for shading device/frost cap.
3. Layout and cut material to length and shape.
4. Position device over plants.
5. Store for later use.

LEARNING ACTIVITIES

1. Attend a lecture/demonstration by your instructor on constructing portable caps. Take notes to make sure you know how to:
   a. take measurements for each cap.
   b. layout and cut material.
   c. make folds in the material.
   d. form folds into caps.

   Your instructor will give you plants to use. Practice making the caps, checking with your instructor after each major step. When your work is satisfactory, go on to Learning Activity 2.

2. Attend a lecture/demonstration by your instructor on portable shading devices. Take notes to make sure you know how to:
   a. take measurements for each shading device.
   b. layout and cut material to size.
   c. assemble materials.
   d. put device over plants.

   Your instructor will give you plants to use. Make portable shading devices for each plant. Check with your instructor after each major step. When your work is satisfactory, go into Learning Activity 3.

3. Attend a lecture/demonstration by your instructor on wrapping container plants from the weather. Take notes to make sure you know:
   a. which plants need to be wrapped.
   b. how high to wrap the plants.
   c. which materials to use.
   d. how to secure the wrapping.

   Your instructor will give you a container plant to wrap and the materials. Wrap the plant and check with your instructor after each major step. When your work is satisfactory, ask for the Evaluation.

EVALUATION

You will be given a container plant. Prepare the plant for cold weather and harsh sunlight. You must receive a satisfactory rating on each item of the Student Checklist below.
You may not use references.

STUDENT CHECKLIST

	Satisfactory	Unsatisfactory
1. Measured plant for cap		
2. Measured plant after shading device		
3. Cut and layed out material		
4. Formed Caps		
5. Assembled shading device		
6. Selected material for wrapping		
7. Wrapped container plant		
8. Secured wrapping		

STUDENT COMPETENCY SHEET

MODULE 06 Transplanting

COMPETENCY 01 Transplant seedlings to pots.

PERFORMANCE GUIDE

1. Select pots to be used.
2. Prepare soil to be used in pots.
3. Place soil in pots.
4. Transplant seedlings to pots.
5. Firm the soil after setting the seedlings.
6. Water thoroughly.
7. Place pots of seedlings in an area to grow.
8. Water periodically.

LEARNING ACTIVITIES

1. Read pages 89-91 "Transplanting Seedlings" in Ornamental Horticulture. In your own words write the steps you should follow when transplanting seedlings. Discuss your work with your instructor.

2. Visit an agribusiness in your area. Make a list of the pots on the market for transplanting seedlings. Write down the advantages/disadvantages of each. Select the one you feel is best. Defend your choice to the class.

3. Attend a lecture/demonstration by your instructor on removing seedlings from the germinating media. After the lecture have the instructor observe your work. When it is satisfactory, ask for the Evaluation.

EVALUATION.

You will be given seedlings ready to be planted in pots, necessary equipment and supplies. Transplant the seedlings to pots. The plant must not be wilted when observed 24 hours later.

STUDENT COMPETENCY SHEET

MODULE 06 Transplanting

COMPETENCY 02 Plant and transplant bulbs.

PERFORMANCE GUIDE

1. Select bulbs to be planted
2. Prepare soil
3. Apply fertilizer
4. Determine spacing
5. Dig proper depth hole in the bed or containers depending on type of bulb
6. Place the bulb in the hole
7. Fill the hole with soil mixture
8. Mulch bulbs in beds
9. Place containers with planted bulbs in an area suitable for growing or forcing

LEARNING ACTIVITIES

1. Read pages 120-122 "Bulbs" in Introductory Horticulture. Answer the following:
   a. What makes up most of a bulb?
   b. What are bulblets?
   c. What are offset bulbs.
   d. When can you dig and separate bulbs?
   e. How should you store bulbs?
   f. What are the parts of a bulb?

   Check your answers with your instructor. When they are satisfactory, go on to Learning Activity 2.

2. Identify the parts of a bulb on Student Handout 06/02/02 without references. When you are 100% correct, go on to Learning Activity 3.

3. Read pages 366-372 in Introductory Horticulture and answer the Self Evaluation on pages 373-374. Check your answers during a class discussion.

4. Plant bulbs given to you by your instructor. You may use the chart on page 367 in Introductory Horticulture and the Performance Guide on the preceeding page as a reference. Check with your instructor after each major step. When your work is satisfactory go on to Learning Activity 5.

5. Attend a lecture/demonstration by your instructor on transplanting bulbs. Take notes on the lecture. Be prepared to pass a quiz on the information.

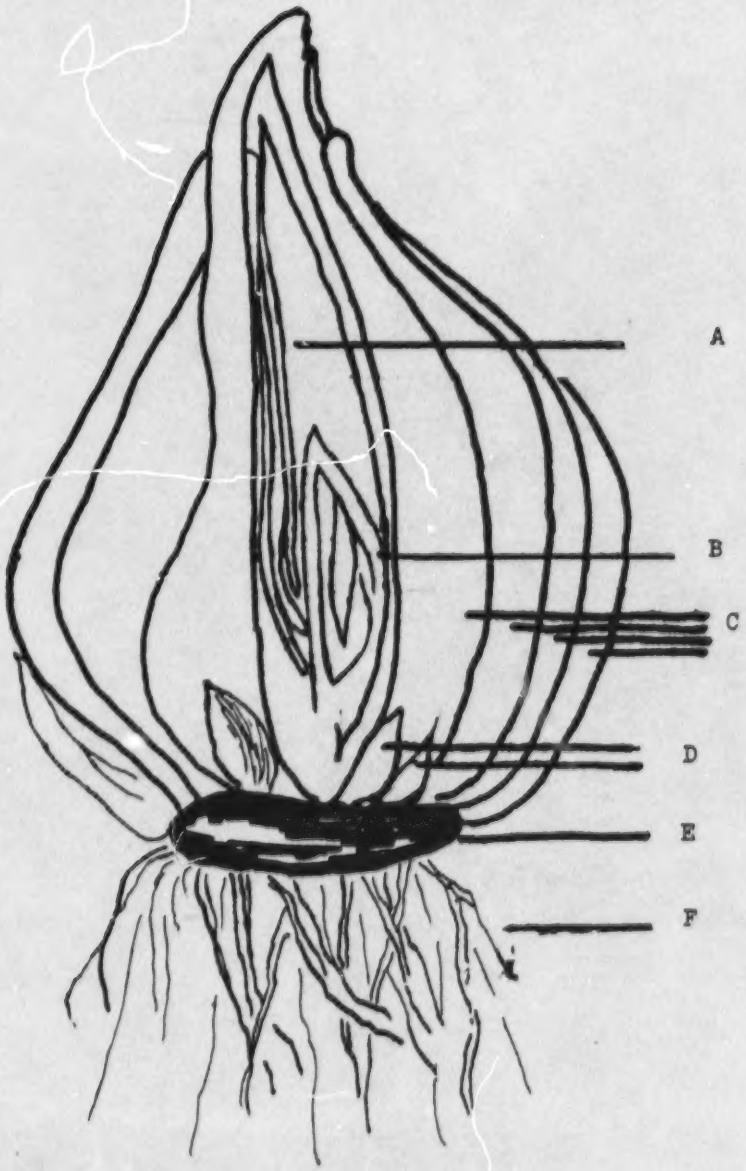
EVALUATION

You will be given bulbs and the equipment and supplies you will need. Plant or transplant the bulbs. The bulbs will be planted at recommended depths, space and time according to planting chart as verified by the instructor.

ANSWERS

STUDENT HANDOUT

06/02/02



ANSWERS

STUDENT HANDOUT

06/02/02

A. Foliage Leaves

B. Flower Bud

C. Bulb Scales

D. Lateral Bulblets

E. Basal Plate

F. Roots

STUDENT COMPETENCY SHEET

MODULE 07 Fertilizer

COMPETENCY 01 Apply fertilizer to nursery stock in containers and in field.

PERFORMANCE GUIDE

1. Select plants to be fertilized.
2. Interpret soil test report.
3. Select fertilizer to be used.
4. Apply fertilizer at recommended rates.
5. Water thoroughly after fertilizing.

LEARNING ACTIVITIES

1. View the filmstrip "Fertilizing Ornamental Plants". Answer the questions given to you by your instructor. When you are finished check your answers during a class discussion.

2. Read pages 35-40 "Plant Food and Fertilizers" in Introductory Horticulture. Your instructor will give you plants which have a need for fertilizer. Use the text as a reference and tell the problem and what you would do to correct it.

3. Read pages 122-134 in The Nursery Worker Part I. Be prepared to pass a quiz on how to take a soil sample and interpret a soil analysis.

4. Attend a lecture from your County Agent on taking a soil sample. After the lecture, your instructor will assign you soil in the field to test. Test the soil and report how you will fertilize the plants after you receive the soil analysis.

5. Follow the steps you outlined in Learning Activity 4 and fertilize the plants. Check with your instructor after each major step. When your work is satisfactory, ask for the Evaluation.

EVALUATION

You will be given nursery stock in containers and in the field. Take a soil sample, interpret the report and fertilize the plants. You may use references. Soil must meet standard requirements upon inspection 48 hours after fertilization.

STUDENT COMPETENCY SHEET

MODULE 07 — Fertilizer

COMPETENCY 02 — Apply liquid fertilizer using fertilizer injection system in greenhouse.

PERFORMANCE GUIDE

1. Select plants to be fertilized.
2. Set up equipment to use.
3. Determine amount and type of fertilizer to use.
4. Apply the fertilizer at recommended rates.
5. Shut down system.
6. Clean and maintain system as needed.

LEARNING ACTIVITIES

1. View the filmstrip "Fertilizing Ornamental Plants". Answer the questions given to you by your instructor. When you are finished check your answers during a class discussion.

2. Read pages 66-67 "Fertilizing With Liquids" in The Green House Worker. Answer the following questions:
   a. How do you mix the liquid fertilizer with water?
   b. How often do you apply the fertilizer?
   c. Discuss the best methods of using a liquid system for potted plants.
   d. Discuss the best methods of using a liquid system for potted plants.

   When you are finished check your work with your instructor.

3. Report on the advantages/disadvantages of a system assigned to you by your instructor. Listen to the other student's reports. As a class decide on the best system for your operation. Consider reliability, capacity, accuracy and cost.

4. Attend a lecture/demonstration by your instructor on operating the fertilizer injection system in your greenhouse. Take notes to make sure you know how to:
   a. set up the system.
   b. compute the amount of fertilizer needed.
   c. apply the fertilizer.
   d. shut down the system.
   e. clean the system.

   Be prepared to pass a quiz on the information.

STUDENT COMPETENCY SHEET

5. Practice using the fertilizer injection system in your green house. Check with your instructor after each major step. When you are ready, ask for the Evaluation.

EVALUATION

You will be given the equipment and supplies you will need. Fertilize plants using a liquid injection system. You may use references. You must receive a satisfactory rating on each item of the Student Check List below.

STUDENT CHECKLIST

	Satisfactory	Unsatisfactory
1. Set up equipment		
2. Fertilizer chosen		
3. Fertilizer applied at proper rates.		
4. Shut down system.		
5. System cleaned and maintained as needed.		

STUDENT COMPETENCY SHEET

MODULE 07 Fertilizer

COMPETENCY 03 Clean hand sprayers and dusters.

PERFORMANCE GUIDE

1. Wear safety clothing and equipment.
2. Check label for any specific instruction.
3. Select a safe place for cleaning and flushing.
4. Drain the equipment tank or empty the hopper.
5. Remove nozzles and clean separately.
6. Flush system with water.
7. Flush system with mixture of water and light oil.
8. Store equipment in a dry place.

LEARNING ACTIVITIES

1. Read pages 91-93 in Applying Pesticides: Management Application Safety. Answer the following questions.
   a. Why is the place you select for cleaning and flushing important?
   b. When you drain the equipment tank or hopper, what do you do with the contents?
   c. When you flush granular equipment, what steps do you follow?
   d. What steps do you follow when trying to clean 2, 4-D from equipment?
   e. Why do you flush the equipment with light oil and water?
   f. What are the steps for cleaning spraying equipment?

   When you are finished, check your answers with your instructor. If they are satisfactory, go on to Learning Activity 2.

2. Attend a lecture/demonstration by your instructor on cleaning equipment which has used 2, 4-D. Take notes. Be prepared to pass a quiz on the different steps to follow when you are using Amines or Sodium Salts of 2, 4-D and Ester Forms of 2-4, D.

3. Attend a lecture/demonstration by your instructor in cleaning dusters and spreaders. In your own words write the steps to follow. Check your work with your instructor.

4. Clean and store equipment assigned to you by your instructor. for each piece of equipment, write the steps you will take and

any special considerations you have to give the equipment due to the chemical used. Have your instructor check your work. When it is satisfactory, ask for the Evaluation.

EVALUATION

You will be given a piece of equipment and a description of the way it was used. Clean and store the equipment. You may use references. You must receive a satisfactory rating on each item of the student checklist below.

STUDENT CHECKLIST

	Satisfactory	Unsatisfactory
1. Safety clothing and equipment worn		
2. Safe place selected for cleaning and flushing		
3. Equipment tank and/or hopper drained		
4. Nozzles removed and cleaned		
5. System flushed		
6. Equipment stored		

STUDENT COMPETENCY SHEET

MODULE 08 — Greenhouse Control

COMPETENCY 01 — Set, operate, shut down, and clean automatic watering system in greenhouse including extension system.

PERFORMANCE GUIDE

1. Test soil for watering needs using tensiometers and/or touch.
2. Select breaker.
3. Attach breaker to hose.
4. Set up automatic system.
5. Set timer.
6. Water plants.
7. Shut down automatic system.

LEARNING ACTIVITIES

1. Read pages 73-76 in The Green House Worker, and answer the following questions:
   a. What is the "old method" of testing for water needs?
   b. What is a method for testing water needs if you are going to hand water?
   c. Describe soil or plants that have not been watered right.
   d. What are breakers?
   e. Describe the Ohio Surface Irrigation.
   f. What is a tensiometer?

   Discuss your answers in a class discussion.

2. Attend a lecture/demonstration by your instructor on watering plants with the Chapin System. Be prepared to pass a quiz on the information.

3. Attend a lecture/demonstration by your instructor on the Ohio Surface Irrigation. Be prepared to pass a quiz on the information.

4. Practice setting up, operating and shutting down the watering system in your greenhouse. Check with your instructor after each major step. When you are ready, go on to Learning Activity 5.

5. Attend a lecture/demonstration by your instructor on maintaining and cleaning your watering system. You must clean and maintain the system when it is in use.

EVALUATION

You will be given an area of plants and automatic watering system. Set, operate, shut down, and clean the system. You may use the manufacturer's manual as a reference. The plants must receive the amount of water required.

STUDENT COMPETENCY SHEET

MODULE 08 — Greenhouse Control

COMPETENCY 02 — Set, operate, shut down, and clean thermostatically controlled heat and light system in greenhouse.

PERFORMANCE GUIDE

1. Determine temperature required for plants being grown in greenhouse and/or stored in other structures.
2. Adjust thermostat to desired temperature.
3. Check the accuracy of the thermostat by placing a thermometer in the greenhouse.
4. Reset thermostat to adjust for any difference between thermometer and thermostat reading.
5. Check temperature of greenhouse and/or other structures periodically to insure desired constant temperature.
6. Set automatic light system.

LEARNING ACTIVITIES

1. Read "Heating" pages 23-24 and "Controlling the Length of Day" on pages 25-27 in The Green House Worker. Answer the following questions:
   a. What are the advantages/disadvantages of using steam vs. hot water?
   b. Define short day plants.
   c. Define long day plants.
   d. Describe the minimum lights necessary for a greenhouse.
   e. What is supplemental lighting? How does it vary throughout the year?

   Check your answers during a class discussion.

2. Read "Controlling Temperature and Ventilation in the Greenhouse" pages 111-113 in Ornamental Horticulture as a Vocation. Be prepared to pass a quiz on the information.

3. Read "Controlling the Elements" pages 105-111 in The Green House Worker. Complete student exercise, "Lighting", on page 111. Check your work with your instructor.

4. Attend a lecture/demonstration by your instructor on controlling heat during the summer. Take notes to make sure you know:
   a. how to mix and apply shading compound.
   b. how to use shades.
   c. how to use sashes to aid ventilation.
   d. how to use moisture pads.
   e. how to arrange "cool" and "warm" greenhouse crops.

5. Record the different plant growth factors for each of the different crops grown in your greenhouse. Use any references, your instructor's and your observations to record the following:
   a. Plant and stage of growth.
   b. Temperature - Night/Day.
   c. Addition of Carbon Dioxide.
   d. Recommended Relative Humidity.
   e. Light Intensity Requirements--Foot Candles.

6. Attend a lecture/demonstration by your instructor on maintaining and cleaning the heating/cooling system in your greenhouse. You must clean and maintain the system as needed.

EVALUATION

You will be given a greenhouse equipped with thermostat and the supplies you will need, adjust the thermostat to maintain a constant temperature within + 2° of the temperature directed by the instructor. You may use any shading and/or ventilating methods. You may not use references. Perform any necessary maintenance on the system.

STUDENT COMPETENCY SHEET

MODULE 09 — Disease and Pest Control

COMPETENCY 01 — Identify diseased plants and plants damaged by insects and/or other animal pests.

PERFORMANCE GUIDE

1. Inspect plant.
2. Inspect soil.
3. Report findings.
4. Identify insects.
5. Identify animal pests.

LEARNING ACTIVITIES

1. Read pages 232-249 in Ornamental Horticulture as a Vocation. Make a chart for easy identification of chewing insects; piercing-sucking pests; rasping-sucking pests. Include on your charts:
   a. drawing or picture of the pest.
   b. where they do the most damage.
   c. type of damage they cause.
   d. how to control them.

   Check your work with your instructor.

2. Read pages 249-250 in Ornamental Horticulture as a Vocation. Be prepared to pass a quiz on the definition of bacteria, fungi, and viruses.

3. Read pages 256-261 "Specific Diseases Caused by Fungi" in Ornamental Horticulture as a Vocation. Make a chart for easy identification of the diseases. Include on your chart:
   a. symptoms of the disease.
   b. causes.
   c. cures.

   Check your work with your instructor.

4. Read pages 262-263 "Specific Diseases Caused by Bacteria" in Ornamental Horticulture as a Vocation. Make a chart for identification of the diseases. Include on your chart:
   a. symptoms of the disease.
   b. causes.
   c. cures.

   Check your work with your instructor.

5. Read pages 263-264 in Ornamental Horticulture as a Vocation "Specific Diseases Caused by Viruses". Make a chart for easy identification of the diseases. Include on your chart:
   a. symptoms of the diseases.
   b. causes.
   c. cures.

6. Read pages 135-136 in The Green House Worker. Make a chart of the common diseases of the crops listed and how to control them. Check your work with your instructor.

7. Read pages 252-258 in The Nursery Worker Part II. Make a chart for easy identification of the insects common to nurseries. Include:
   a. drawing or picture of the insect
   b. where they do the most damage.
   c. type of damage they cause.
   d. how to control them.

   Check your work with your instructor.

8. Read pages 264-273 in The Nursery Worker Part II. Make a chart for easy identification of nursery diseases caused by bacteria. Include:
   a. symptoms.
   b. how it is caused.
   c. how to control it.

   Check your work with your instructor.

9. Use the charts you made in Learning Activities 1-8 and practice diagnosing damaged plants given to you by your instructor. For each plant list:
   a. type of disease or animal pest.
   b. common name of disease.
   c. symptoms.
   d. how you made your diagnosis.

   When you are ready, ask for the Evaluation.

EVALUATION

You will be given a group of damaged plants. Identify the disease or animal pest with 100% accuracy. You may use any references you wish.

STUDENT COMPETENCY SHEET

MODULE 09 — Disease and Pest Control

COMPETENCY 02 — Prepare insecticide, herbicide, and fungicide for application.

PERFORMANCE GUIDE

1. Calculate the square footage to be covered by the herbicide, insecticide, and/or fungicide.
2. Measure the herbicide following the manufacturer's specifications.
3. Fill tank to required level with water and engage the agitator.
4. Add chemicals slowly in the prescribed amounts.
5. Check to make sure the chemicals are dissolved.
6. Destroy used cartons and return leftover materials to storage.

LEARNING ACTIVITIES

1. View the filmstrip Selecting Pesticides and read pages 14-18 in Applying Pesticides: Management Application Safety. Find examples of the following:
   a. danger signal word
   b. warning signal word
   c. caution signal word
   d. pesticide which exposes pests through mouth, contact, or by breathing
   e. brand name of a liquid EC
   f. brand name of a solution
   g. brand name of a flowable
   h. brand name of a fumigant
   i. brand name of an aerosol
   j. selective pesticide
   k. non-selective herbicides

2. Attend a lecture by a person from the Environmental Protection Agency (EPA). Write a report on how the regulations will affect you, once you are working.

3. Pass the quiz on pages 5-10 in Applying Pesticides: Student Workbook You must achieve 80% on the quiz.

4. View the filmstrip Handling Pesticides Safely. You must observe these safety precautions at all times. Pass a quiz on the information with 80% accuracy.

5. Read pages 73-80 in Applying Pesticides: Management Application Safety. Work the problems for Acre-Volume Method, and Time-Volume Method on pages 76-79. When you are finished, check your answers with your instructor.

6. Read pages 79-81 in Applying Pesticides: Management Application Safety. Practice mixing liquid emulsions and wettable powder. When you are ready, demonstrate these skills for your instructor:
   a. procedure for mixing liquids
   b. mix a slurry
   c. add slurry to tank

EVALUATION

You will be given an area of land, directions for pesticides, and the equipment you will need. Compute the amount of pesticide to use and mix it according to the manufacturer's directions. You must destroy used cartons and return leftover materials to storage.

STUDENT COMPETENCY SHEET

MODULE 09 — Disease and Pest Control

COMPETENCY 03 — Control weeds in nursery stock in container and in field by hand cultivation and hand weeding.

PERFORMANCE GUIDE

1. Determine hardness of soil. If soil is hard, soften with sprinkled water.
2. Take shallow, short strokes with hoe to uproot weeds and grass.
3. Pull weeds by hand that are growing too close to plants.
4. Using hoe, rake weeds and grass.
5. Dispose of weeds and grass.
6. Add new soil in holes created by uprooting weeds and grass.

LEARNING ACTIVITIES

1. In a small group, write a definition for "weed". When you agree on a definition, compare it to another small group. As a class, decide upon your definition of a weed.

2. Study a field area or containers. Sketch each of the weeds you find. Identify each one. If you have any trouble, ask your instructor for help.

3. Follow the steps in the Performance Guide above and practice weeding. Check your work with your instructor after you complete each step. When you are ready, ask for the Evaluation.

EVALUATION

You will be given a hoe and a rake, remove unnecessary weeds from a field. The topsoil must be left smooth.

STUDENT COMPETENCY SHEET

MODULE 10 Sale Preparation

COMPETENCY 01 Dig shrubs and trees, including ball, burlap, and bare root methods.

PERFORMANCE GUIDE

1. Make a trench around the plant to be transplanted.
2. Pull loosened soil away from plant.
3. Cut the ends of the roots.
4. Lift wall of soil and plant from the hole.
5. Ball and burlap the plant.
6. Plant in new location.

LEARNING ACTIVITIES

1. Attend a lecture by your instructor on harvesting trees and shrubs using ball and burlap method. Take notes to make sure you know:
   a. how to prepare the plant for digging .
   b. how to dig the stock.
   c. how to transport the plant.

   Be prepared to pass a quiz on this information.

2. Read pages 3-7 in Ornamental Horticulture: Harvesting and Planting Trees and Shrubs. Your instructor will assign you specific trees for you to plan their transplant. In your report include the following information:
   a. minimum ball size.
   b. time to move the plant.
   c. steps to dig the plant.
   d. how to transport.
   e. how to store plant.
   f. when and how to plant the tree/shrub.

3. Read pages 8-9 in Ornamental Horticulture: Harvesting and Planting Trees and Shrubs. Your instructor will assign you trees and shrubs for you to plan their transplant using the bare root method. Include the following in your report:
   a. how to puddle the roots.
   b. how to transport the plant.
   c. heeling-in procedures.
   d. when and how to plant the tree/shrub.

4. Practice digging a tree or shrub. Check with your instructor after each major step listed above in the Performance Guide. When you are ready, ask for the Evaluation.

EVALUATION

You will be given a tree or shrub to transplant. You must receive a satisfactory rating on each item of the Student Checklist below.

STUDENT CHECKLIST

	Satisfactory	Unsatisfactory
1. Plant dug correctly		
2. Correct harvesting method chosen		
3. Roots protected		
4. Tree/shrub transplanted correctly		

STUDENT COMPETENCY SHEET

MODULE 10 Sale Preparation

COMPETENCY 02 Pot plants from flats, trays or beds.

PERFORMANCE GUIDE

1. Select pots or flat to be used.
2. Prepare soil to be used in pots.
3. Place soil in pots.
4. Transplant seedlings to the pots.
5. Firm the soil after setting the seedling.
6. Water thoroughly.
7. Place pots of seedlings in area to grow.
8. Water periodically.

LEARNING ACTIVITIES

1. Read pages 89-91 "Transplanting Seedlings" in Ornamental Horticulture. In your own words write the steps you should follow when transplanting seedlings. Discuss your work with your instructor.

2. Visit an agribusiness in your area. Make a list of the pots on the market for transplanting seedlings. Write down the advantages/disadvantages of each. Select the one you feel is best. Defend your choice to the class.

3. Attend a lecture/demonstration by your instructor on removing seedlings from the germinating media. After the lecture have the instructor observe your work. When it is satisfactory, ask for the Evaluation.

EVALUATION

You will be given seedlings ready to be planted in pots, necessary equipment and supplies. Transplant the seedlings to pots. The plant must not be wilted when observed 24 hours later.

STUDENT COMPETENCY SHEET

MODULE 10 — Sale Preparation

COMPETENCY 03 — Grade harvested plants and label by common names.

PERFORMANCE GUIDE

1. Check plants for size.
2. Check plants for form or shape.
3. Check plants for texture.
4. Check plants for color or foliage.
5. Check plants for disease, insects, and mechanical damage.
6. Grade or group plants according to the U. S. A. Standard for Nursery Stock.
7. Determine the name of the plant to be labeled.
8. Print name of plant on the label with specified marker.
9. Attach label to a sturdy branch of the plant.

LEARNING ACTIVITIES

1. Attend a lecture/demonstration by your instructor on types and uses of Calipers. After the lecture, practice using calipers until you can measure tree branch and trunk diameters within ± ¼".

2. Get a copy of the U. S. A. Standard for Nursery Stock. You may use this as a reference for the following learning activities. Study the book so you know where to find standards for shade trees, ground covers, vines etc.

3. Practice grading plants given to you by your instructor. Report orally or in writing how you decided on each grade. Check your work with your instructor.

4. Attend a demonstration by your instructor on labeling plants. Take notes to make sure you know:
   a. what markers to use.
   b. where to attach the label to the plant.

   After the lecture, practice labeling plants. When you are ready, ask for the Evaluation.

EVALUATION

You will be given a group of harvested plants and the equipment and supplies you will need. Grade and label the plants. The grade must agree with the U. S. A. Standard for Nursery Stock. Labels must be tied to a sturdy branch and printed with a waterproof marker.

STUDENT COMPETENCY SHEET

MODULE 10 Sale Preparation

COMPETENCY 04 Prepare plants and shrubs for shipment.

PERFORMANCE GUIDE

1. Select plants to be bundled and wrapped.
2. Determine number of plants per bundle.
3. Place plants of same size in bundles.
4. Secure the bundle by tying a soft string around it.
5. Label plants.
6. Place moist peat moss, saw dust or other material on the roots.
7. Wrap paper or other material securely around lower half of the plant bundle.
8. Tie soft string around paper to hold it in place.
9. Label and date plants.
10. Determine number of bundles to be packed in each carton or crate.
11. Place bundle in alternating layers in the carton or crate.
12. Close the carton or crate and secure it for shipment.
13. Label and date the plants.

LEARNING ACTIVITIES

1. Read pages 300-306 in The Nursery Worker Part II. Report orally the differences in packing orders for a mail order nursery and a wholesale nursery.

2. Attend a lecture/demonstration by your instructor on bundling plants. After the lecture, practice bundling the plants. Have your instructor check your work. If it is satisfactory, go on to Learning Activity 3.

3. Talk to a manager of a nursery or greenhouse in your area about the best materials to use to wrap roots of larger plants. Report your findings to the class.

4. Attend a lecture/demonstration by your instructor on wrapping plants. After the lecture practice wrapping the plants. Have your instructor check your work. If it is satisfactory, go on to Learning Activity 5.

5. Attend a lecture/demonstration by your instructor on shipping

plants. Take notes to make sure you know:

a. how to determine the number of bundles to be packed in each carton or crate.
b. how to secure the crate for shipment.
c. postal requirements.

Be prepared to pass a quiz on the information.

EVALUATION

You will be given a supply of plants to be shipped. Bundle, wrap and pack the plants. You must receive a satisfactory rating on each item of the Student Checklist below. You may not use references.

STUDENT CHECKLIST

	Satisfactory	Unsatisfactory
1. Plants bundled according to size		
2. Bundles secured		
3. Bundles labeled and dated		
4. Roots packed with proper material		
5. Roots wrapped		
6. Wrapped roots labeled and dated		
7. Bundles packaged for shipment according to postal requirements		

STUDENT COMPETENCY SHEET

MODULE 11 Special Duties

COMPETENCY 01 Force potted plants to bloom in season.

PERFORMANCE GUIDE

1. Select plants to be forced into bloom.
2. Determine day length and temperature required to bring plants into bloom.
3. Continue fertilization necessary to aid in blooming.
4. Place the plants in an area equipped to control the day length and temperature.
5. Control the day length and temperature until flower buds mature to the proper stage.

LEARNING ACTIVITIES

1. Read pages 25-27 in The Green House Worker. Outline the steps to force short day plants and long day plants. Check your answers in a class discussion.

2. Make two schedules of day lengths for the plants in your area. One for long day plants and one for short day plants. Include the name of the plant, period of year when days are lengthened, time schedule during day for shading, temperature maintained, and the marketing season for plants.

3. Read pages 159-167 "Poinsettas" in Introductory Horticulture. Answer the Self Evaluation on pages 166-168. Check your answers with your instructor. If they are correct, go on to Learning Activity 4.

4. Follow the steps outlined in Learning Activity 3 and force poinsettas to bloom. Check with your instructor after each major step.

5. Read pages 169-177 "Chrysanthemums" in Introductory Horticulture. Answer the Self Evaluation on pages 166-168. Check your answers with your instructor. If they are correct, go on to Learning Activity 6.

6. Follow the steps outlined in Learning Activity 3 and force chrysanthemums to bloom. Check with your instructor after each major step.

EVALUATION

You will be given plants to be forced into bloom at a specified time and the equipment and supplies you will need. Outline the schedule you will follow, including time schedule during the day for shading and temperature maintenance. Force the plant to bloom. Plants must bloom as scheduled.

STUDENT COMPETENCY SHEET

MODULE 11 — Special Duties

COMPETENCY 02 — Interpret and maintain records for nursery and/or greenhouse.

PERFORMANCE GUIDE

1. Keep list of accounts.
2. Keep records on orders.
3. Keep pricing records.
4. Keep inventory records.
5. Keep worker time records.

LEARNING ACTIVITIES

1. Visit a nursery and/or greenhouse in your area and talk to the owner/manager. List the records the owner/manager feels are most important. As a class, make one long list of all the records a greenhouse or nursery should keep.

2. Read pages 315-316 in The Nursery Worker Part II. In a small group, list the different businesses from which a nursery or greenhouse needs to make purchases. Set up a filing system to keep records of purchases made from these companies.

3. Read pages 318-320 in The Nursery Worker Part II. Use the time card and the Daily Labor Job Record and keep your small group's time for two weeks. Check your work with your instructor.

4. Visit a greenhouse or nursery in your area and observe the records kept on sales. As a small group, set up a system to record sales in your greenhouse or nursery. Check your work with your instructor. If it is satisfactory, keep a record of all sales in your greenhouse/nursery for two weeks.

5. Read pages 324-326 "Pricing" in The Nursery Worker Part II. Your instructor will assign you three plants. Compute the cost of producing the plant, what the profit should be and the cost to the consumer. Check your work with your instructor.

6. Read pages 326-327 "Inventory" in The Nursery Worker Part II. Visit a greenhouse/nursery in your area and report on the way they take inventory to your class. Decide as a class how to take an inventory of your nursery/greenhouse and conduct the inventory. Check your work with your instructor. If it is satisfactory, ask for the Evaluation.

EVALUATION

Given the supplies needed, you will keep records of student time, sales, and purchases for one week for your nursery or greenhouse. You must be 100% accurate in your entries.